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A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. XLIX
No. 1278

SATURDAY, DECEMBER 25, 1943
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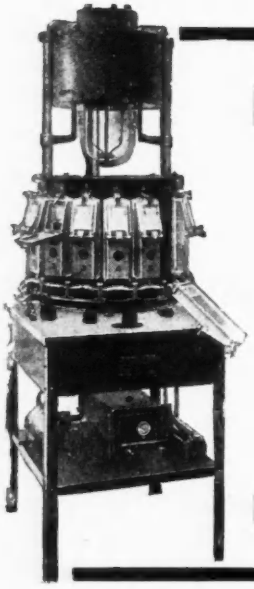

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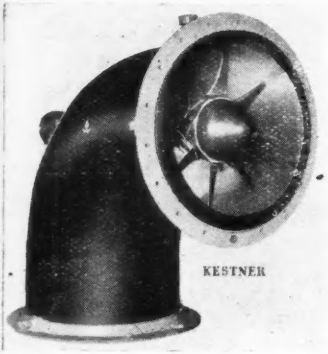

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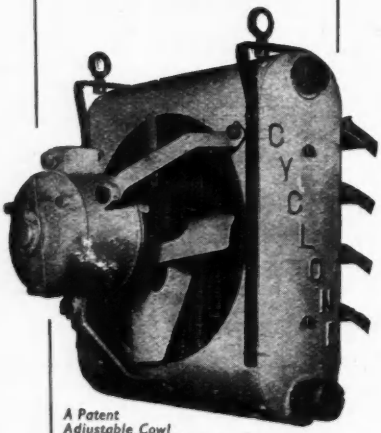

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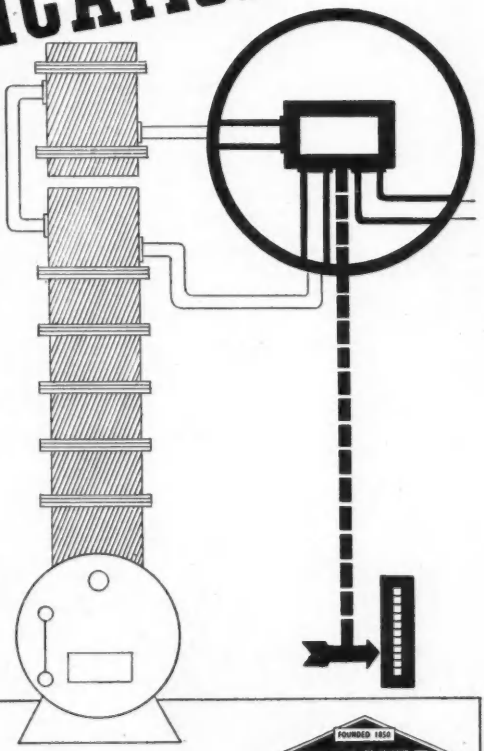

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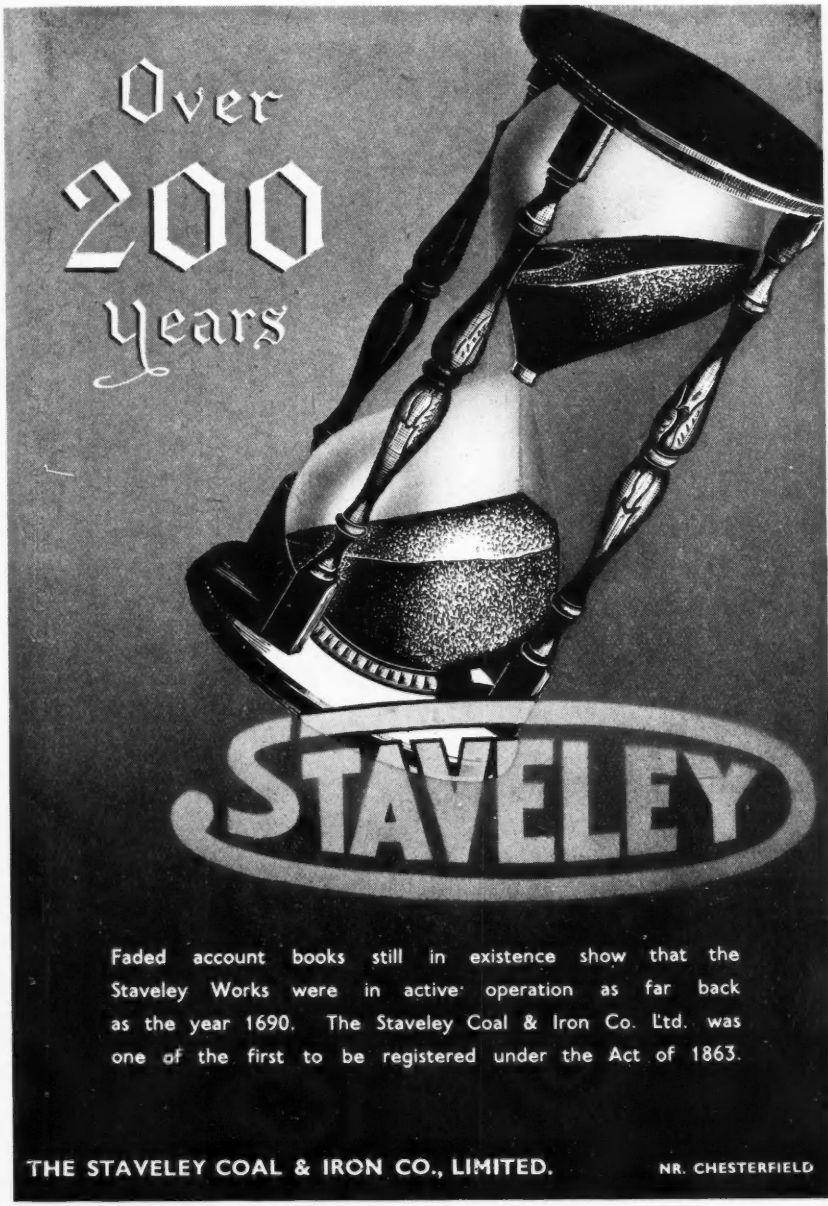

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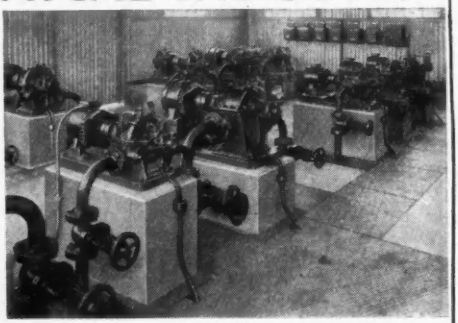

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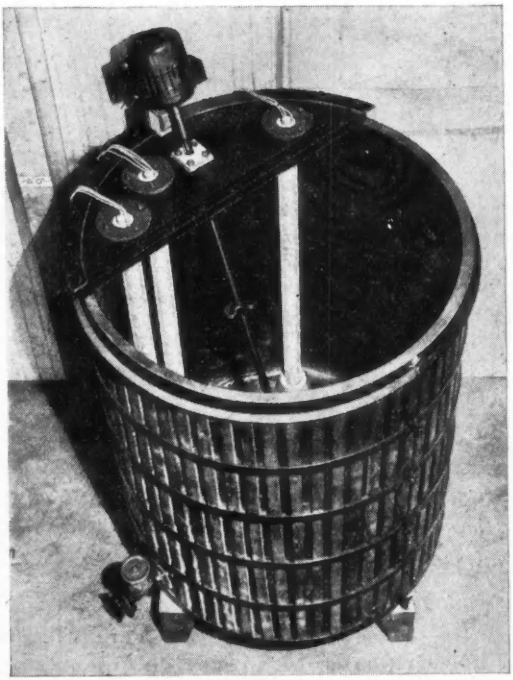

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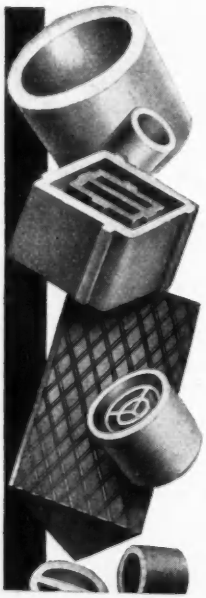

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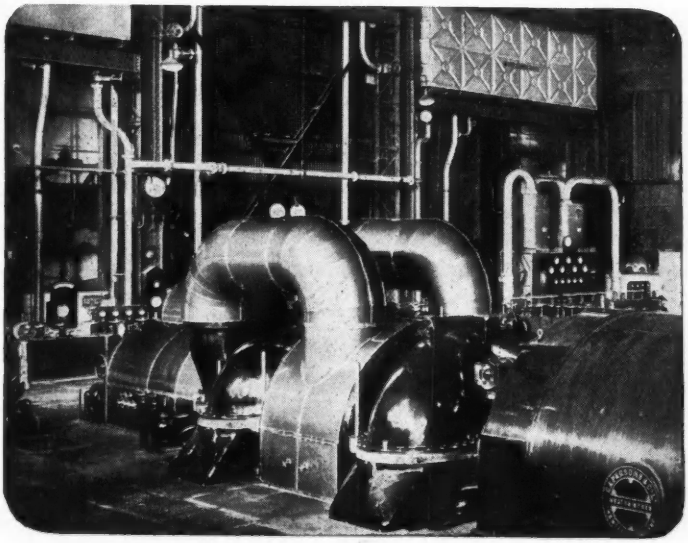

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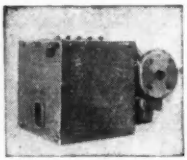

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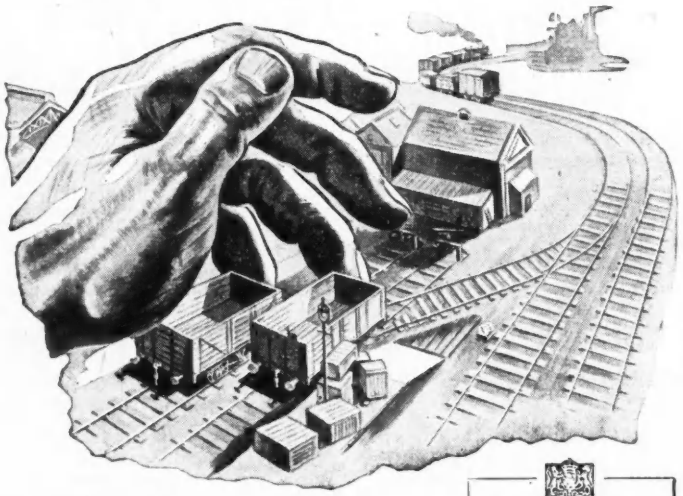

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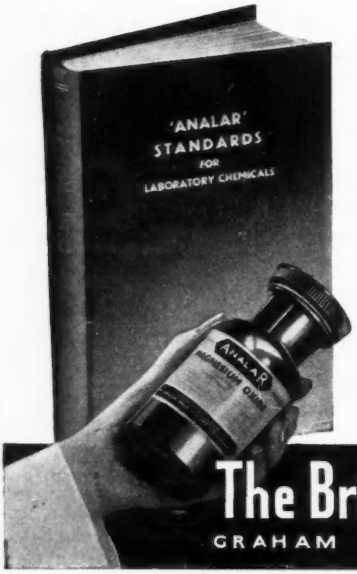

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Wanted—a Home!

MANY demands are being made upon the Ministry of Reconstruction and the latest of them emanates from certain scientific bodies. It is a very simple one: "Give us a home." The president of the Royal Society, Sir Henry Dale, has urged that plans for the reconstruction of London should include provision for a spacious central home for the scientific societies. He has pointed out that provision should be made, and rightly so, for painting, music, opera, the drama, and the fine arts generally. Why not for science also?

There is no doubt that scientific and technical societies are badly housed in general. They have a great deal of useful work to do; they are a great educative force which, by keeping the profession together, assists materially in the more rapid spread of new knowledge. As the publishers of research work, their rôle is of the greatest importance at a time when the nation is looking to research to rehabilitate its fortunes. It would be impossible for most research workers to publish their own researches on account of the expense: any possibility of that has been removed by taxation. And even if the researches were to be published privately, they would not be discussed, for there would be no machinery for drawing together the requisite audience. A hall must be hired for that purpose, and that alone would cost several guineas. The audience must be gathered together, and this would be difficult unless there were some machinery whereby those who assembled would have some assurance that the paper would, in fact, be worth hearing and that they had not come in vain. The scientific and technical societies provide all these things for a modest subscription, and, by making that provision, they materially assist the development of science and technology. We have only to contemplate the condition of certain industries before, and 20 years after, a technological or scientific association to serve them had been set up, in order to see exactly what effect this dissemination of knowledge can have, and how laggard an industry or a science can be without it.

The provision of library facilities is another important function of most societies. Here again, there is no doubt that the volume of material published to-day is too great for anyone to hope to keep pace with it, even in a fairly specialised field. Each industry

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has usually two or three or half-a-dozen technical papers through which is spread a great deal of information that must not be neglected. In addition, work bearing on that industry may be published in hundreds of transactions, journals, and so forth. The fact that no one can read and remember all this literature makes it all the more important that it should be available readily to those who wish to consult it. If it is distributed, it is the more difficult to do so. It is almost essential to-day that each science and each industry should form its own comprehensive library.

The Royal Society holds a unique place. Sir Henry Dale rightly urges that it should have a building where it may co-ordinate its activities with economy, which gives room for change and expansion and organic growth. After years of inadequate accommodation it was able to obtain, in 1870, the rooms at Burlington House that it now occupies. But already by 1900 it was beginning to find its accommodation limited. "Its walls could not find room to hang the Society's collection of scientific portraits. Its great library was badly overcrowded, and it continues to grow." The Chemical Society is in no better case.

Some few years ago we called attention to the unsatisfactory character of its rooms as a meeting place for the Society of Chemical Industry. The president of the Chemical Society has written that when it was given its lease at Burlington House its membership was 800; it now has over 5000 Fellows. The library now comprises 45,000 volumes of which only 19,000 can be housed in the main library and all available storage space is filled. "The Society's present meeting room is totally inadequate for the needs of one of the largest learned societies, and when lectures by distinguished British or foreign chemists are given before the society accommodation has to be sought elsewhere. The society has no accommodation for editorial work, and its administrative work is carried out in one small office . . . the position is now desperate."

All this is very true, but it must inevitably provoke further discussion. The plight of the Royal Society and the Chemical Society is shared by other equally important bodies. It cannot be said that any one science or technological body is so clearly outstanding that special consideration must be given it by the Government to the exclusion of other claimants. Nearly every society and institution can make out an equally good case. The Electricals, the Civils, the Mechanicals have magnificent buildings which adequately house their activities. Surely our chemical industry is not so poor that it cannot make provision for housing pure chemists, chemical engineers, and industrial chemists adequately. This has been a burning question for some years, and it must be faced when London is reconstructed. Again, what of fuel? British industry is based on coal. We should have such a central building that all the manifold activities of the fuel industries and of fuel technology can be housed therein. There is no such building, but the gas industry has in Gas Industry House a home which provides adequate space for all the technical, and some of the administrative, offices of the gas industry, together with its library.

The appeal to the Government to do something appears to be beside the point. The Government can hardly provide for one alone, but must provide for all. It must be left to the individual societies concerned to take steps to find the necessary funds to erect or rent such offices as they may want. When funds are insufficient, more than one society should join forces. There is a lot that can be done without crying for Government help at every stage. The scientific and technical institutions should put their houses in order and compress their activities so as to bring them within manageable proportions. It may seem heresy to some, but frankly we have never succeeded in persuading ourselves that it was necessary to have a chemical engineering group of the Society of Chemical Industry *and* an Institution of Chemical Engineers. That applies in other directions as well. There is far too much overlapping already. Let us begin by concentrating our forces, and then we can afford to build up fewer but better libraries and societies and to house them suitably. The rate of growth of literature and science is so rapid that whatever room is regarded as adequate in 1945 will probably be "totally inadequate" by 2000. That fact alone must cause pleas for magnificent central buildings to be looked upon with caution.

NOTES AND COMMENTS

Films for Science

WE welcome the formation of the Scientific Film Association. This new body is committed to a policy that is at once practical and ambitious, and many of its "action points" can be put into effect with little delay. Recently, we mentioned Miss Mary Field's advocacy of the wider use of film by industry. Now all industries that are based on applied science should give their support to the new association, for it offers a means of putting on to the cinema screen films that will reveal the true significance of science in modern society. At present the science exhibited to cinema audiences is all too often a mixture of mumbo-jumbo and caricature; film producers delight in crack-brained inventors who experiment in the cellar and who always end up as the victims of uncontrollable explosions that remove the pictures from the drawing-room wall, but confer no other noticeable benefits upon mankind. The more perverted type of Hollywood scientist is less of a fool and more of a mediæval magician; producing Frankenstein monsters and Invisible Men with rather less labour than it takes to plant a packet of seeds. But film, a medium of great power, can as easily be used to give the right perspective as the wrong one. The film biographies of Pasteur, Ehrlich, and Edison and the brilliant nature films made by Mary Field and Percy Smith show how cinema can be used to create a dramatic yet accurate picture of science as the scientist knows it.

Scientists Study the Screen

THE development of the scientist's interest in the potentialities offered by scientific films is worth attention. The Scientific Film Association is not a bolt from the blue; it has well-defined origins and its antecedents can be traced back to a film-study group set up in 1936, which developed into that useful body, the Scientific Films Committee of the Association of Scientific Workers. Existing scientific films are of varying quality, and the appraisal of each picture's worth was one of the tasks that the Scientific Films Committee set itself. To anyone who wanted to organise a programme of scientific films, that committee was able to give assistance by providing a list of suitable material. We gather that the Scientific Film Association will collaborate with the A.Sc.W. committee and with other bodies already viewing films, for the purpose of developing a standard system of grading and classifying scientific films. Another offspring of the original film study group of 1936 is the London Scientific Film Society which arranges programmes of scientific films that are not ordinarily shown in commercial cinemas.

The Economic Side

SINCE the formation of that society, some fifty other scientific film societies have sprung up, and the existence of these specialised audiences now counts as an economic factor in the production of "shorts" about science, although it would not be possible to recoup the cost of a film by distributing it to those societies alone. The Scientific Film Association wants to see more scientific films produced. It might, for instance, go to the Government or to the British Council and suggest that a film be produced to tell the story of the discovery of penicillin, its preparation and its use. A film about pencillin would have a vivid and popular appeal, and we hope that the Film Association will adopt our suggestion. Industrial organisations like I.C.I., Ltd., have also shown an interest in the cinema. Recently, for example, I.C.I. released a colour film that traced the history of a new dye, Monastral blue, from its discovery to its industrial application. We hope more commercial concerns will follow suit.

Deputation Results

REPLIES of Ministers to the requests of the deputation organised by the Parliamentary and Scientific Committee, and led by Lord Samuel, have been reasonably described as "encouraging." As readers will remember, in our last issue we gave some account of the distinguished body of scientists, peers, and M.P.s who approached Ministers with a demand for larger Government grants and other aid for post-war scien-

tific research; and now the Ministers have spoken, Mr. Attlee, Deputy Prime Minister, acting as mouthpiece. The mere existence of the committee, he said, was evidence of the keen desire for more science in our national affairs; but if the Government was to play its part there must be equal interest and activity on the part of industry and the public. The attitude of the ordinary citizen, he said, was of great importance in this respect. He believed the Treasury was "sympathetically inclined," but he declined to commit the Government in any way, and hedged his statement about with all manner of provisos and warnings. Such a statement, at this stage, is all that anyone has a right to expect from the Government. While they are as ready as anyone else to admit that there will probably be a crying need for research and other scientific workers after the war, they cannot be censured for their caution in ensuring that any money spent is spent in the right direction. Members of the deputation can feel satisfied that their time has not been wasted; they received official assurance that plans for science hold a high place in the minds of all members of the Government, and they extracted from the Chancellor of the Exchequer a request for concrete examples of the effect of taxation on private industrial research.

Technical Censorship

RECENTLY we stressed the need for closer co-operation between the technical censors of Britain and America. We urged that they should decide between them what developments must be kept secret, and that their joint decisions should then be upheld consistently on both sides of the Atlantic. For it is obviously of little use for the British Press to be warned off a particular subject if the American Press is allowed to print elaborate details about it. We are glad to find signs that the two technical censorships have been brought into line, and we hope that the process will continue until all serious disparities have been removed. The Press of this country is no less patriotic than the censors, and is always prepared to abide by censorship restrictions where these are sane, consistent, and fair. Our censors are not far from achieving the ideal form of censorship, under which security would be the sole criterion. Such a criterion, however, must needs leave room for differences of opinion that have to be settled according to the principle "The censors' decision is final." But for that maxim to deserve the respect and compliance of editors it is essential that petty jealousies within and between Government departments must never be allowed to prevent the publication of facts to which no exception can be taken on security grounds. The idea that one of the best ways of maintaining security is for Government departments to issue the news and for the Press to confine itself to the details given in official hand-outs will also not commend itself except in very special circumstances. Such methods may be necessary on occasions, but only very rarely.

Work for the Disabled

THE views of the British Legion on the employment of disabled ex-Service men are always worthy of respect, and they must certainly be taken into account by the Government now that it is formulating the country's policy on this point. No one knows yet what quota of disabled workers individual firms will have to accommodate. The British Legion has asked that preference shall be given to the ex-Service man and woman, the only proviso being that such privilege shall not operate against the interests of the nation as a whole. The man who has been injured on war service has, indeed, won the right to expect that the community shall guarantee his livelihood not merely after the war, but from the very moment of his injury. But what of the men who have shown equal gallantry and who have escaped injury? Surely the community is equally indebted to them. Is it really possible to divorce the aim of treating ex-Service men as they deserve from the aim of ensuring full employment in Britain? We doubt it, for only with full employment will it be possible for the country to honour the pledges to which the Government is about to commit us. We support the British Legion's demands, but only so far as they are integrated into a policy of maximum employment.

Electrolysis in Organic Chemistry

New Preparative Technique

THE remarkable progress achieved in the application of electrolytic methods to the preparation of organic compounds in recent years has been described by Glasstone and Hickling in their *Electrolytic Oxidation and Reduction* (New York: Van Nostrand, 1936), and more recently in Kolthoff and Lingane's *Polarography*, dated 1941. Lingane and co-workers have now developed a technique (*J. Amer. Chem. Soc.*, 1943, 65, 1348) which should greatly facilitate still wider application of these preparative methods. Hitherto they have not been used to the extent warranted by their many advantages, mainly owing to the difficulty of predicting the optimum conditions required. This has necessitated a large number of trial-and-error experiments to establish even approximately the correct conditions. The very empirical nature of the older electrochemical methods is shown in the almost universal custom of specifying c.d. (current density) as a variable of great importance; although, as a matter of fact, this by itself is almost useless unless other equally important factors are known: cell design and resistance, exact composition of the electrolyte solution, temperature, etc.

Controlling Electrode Potential

This practice has long tended to obscure the fundamental fact that electrode potential and not c.d. is the essential condition which usually determines success or failure. The c.d. cannot be adjusted arbitrarily to produce the desired rate of electrolysis without regard to electrode potential. The importance of this has long been known, but the preliminary determination of its optimum value in any given instance has been difficult and often practically impossible by the ordinary methods, save in a few exceptional cases. The authors, therefore proposed to demonstrate the extent to which electrolytic methods could be rationalised and improved by using polarographic electrolysis as pilot technique to establish the required optimum conditions beforehand.

From such preliminary polarographic investigation of any proposed starting material, under widely diverse conditions of solution composition, etc., the correct specification for large-scale work can usually be determined for practically quantitative yields whether the electrode reaction is reversible or not. Since this method need not be limited to the drop mercury electrode, but can be applied also to solid micro electrodes, it can also serve to determine the most satisfactory electrode material for any given reaction. Thus the new method is particularly useful in selective oxidation of alcohols, etc., at a large platinum anode; and also in solving the frequent and often difficult problem of selecting the proper chemical reducing or oxidising agent for a desired reaction, especially where it goes through several stages. Predictions may

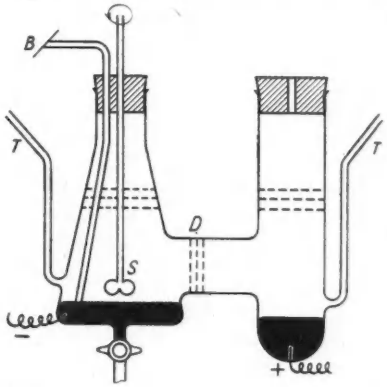


Fig. 1. Electrolytic cell for an organic reduction.

sometimes be upset by secondary reactions and care has to be taken to see that these are allowed for, and so far as possible prevented.

The present study is concerned chiefly with the application of the proposed method to the preparation of 9-(*o*-iodophenyl)-dihydroacridine by reduction of 9-(*o*-iodophenyl)-acridine. The usual polarographic technique was employed, using a simple manual apparatus described in previous work by the authors (*J. Amer. Chem. Soc.*, 1939, 61, 825, and *Polarography*, quoted above). A hydrogen-type polarographic cell with a separate calomel working-reference electrode and a drop electrode assembly were used. Air was removed from the solutions with nitrogen and the temperature used was 25°C.

The type of cell finally chosen for preparative work at controlled potential is shown in Fig. 1. It includes the required features of reasonably low resistance (about 180 ohms with electrolyte concentration of the order of 0.5 M), minimum interdiffusion of catholyte and anolyte, and provision for removing dissolved air from both compartments; this last, though not always necessary, was an essential precaution in the present case. The large compartment was

constructed from a 500 c.c. wide-mouthed Erlenmeyer flask. A coarse sintered-glass disc *D*, 4 cm. diam., is sealed into the connecting tube between the two compartments to minimise interdiffusion. Both compartments are provided with gas inlet tubes *T* for removal of dissolved air with a stream of nitrogen. In the experiments described a large pool of mercury on the bottom of the larger compartment was used as the working electrode (cathode) and a smaller pool of mercury on the bottom of the smaller compartment served as the auxiliary electrode (anode).

With the exception of the substance to be reduced, both compartments contained the same solution. With the alkaline supporting electrolyte used, the reaction at the anode was oxidation of the mercury to mercuric oxide; the latter was formed in a loose way which did not in any way interfere with the passage of current, and, since the current density never exceeded about 0.01 amp./cm.^{2}, the anode potential remained quite constant. For cases in which the presence of oxygen is not objectionable a large platinum or carbon anode can be used. A glass stirrer *S* is provided to secure proper control of the potential of the working electrode, and of course the magnitude of the current used depends very much on the rate of stirring.

Colonial Products Research

New Council's Report

THE first interim report of the Colonial Products Research Council, which was set up at the beginning of this year under the chairmanship of Lord Hankey, is published in the 1942-3 Progress Report of the Colonial Research Committee (H.M.S.O., price 6d.). The Council, an executive body intended to fill one of the gaps in the existing organisation of research into colonial products, has wide terms of reference, so that no colonial product of any kind is outside its scope. It has been decided, however, to concentrate initially on those commodities which are least well served by existing public or private research organisations.

The council will accordingly leave over, for the present, research on rubber, textile materials, timber, tea and metals such as tin and copper. By delegating specific problems to the laboratories of universities and other institutions, the council has been able to initiate research without waiting for the establishment of a central research institution. This procedure has the advantage of spreading knowledge of and interest in colonial scientific problems, and increases the likelihood of discoveries in other researches being made available for the benefit of the Colonies. In addition, close contact is maintained with industry, and some of the work of the council has actually been undertaken at the suggestion of industry. With the object of securing a mutually profitable interchange of information and allocation of effort, the Director of Research, Professor J. L. Simonsen, is maintaining contact with research institutions abroad, notably in the Dominions and India.

The immediate research programme involves work on sugar, vegetable oils, and certain essential oils, in particular clove oil and citrus oils. The research into sucrose and sucrose derivatives is being undertaken at the University of Birmingham by Professor W. N. Haworth; into eugenol and isoeugenol (the active principles of clove and other essential oils) at the University of Durham by Professor R. G. Clemo; into lime oil, lime juice and citrus at the Imperial College of Science and Technology by Professor I. M. Heilbron; into fixed oils and fats at the University of Liverpool by Professor T. P. Hilditch, and at the Lister Institute by Dr. Ida Smedley-MacLean; into caffeine and theobromine at the University of Manchester by Professor A. R. Todd; into petroleum products at the Dyson Perrins Laboratory, Oxford, by Professor Sir Robert Robinson, in consultation with the Research Department of Trinidad Leaseholds, Ltd.; and into the production of ergosterol at the Chemical Research Laboratory of the Department of Scientific and Industrial Research by Dr. A. C. Thaysen. It is stated that the council is co-operating with Government departments in other work, details of which must for the present be kept secret. At the request of the Medical Research Council, the council is also engaged in reviewing the field of research into vegetable drugs.

The discovery of boron, in quantities of 0.2 to 0.5 per cent. B_2O_3, or even more, in South African examples of the manganese ore braunite, has been made spectrographically in the Mineralogical Laboratories of the Union Geological Survey. It is suggested that its presence is due to the isomorphic replacement of silicon within the crystal lattice (Wasserstein, *S. Afr. Min. and Eng. J.*, 1943, *54*, 2649, p. 213).

Seven companies making pharmaceuticals and biological products are being merged to form Wyeth, Inc., which will be one of the biggest drug houses in the States. Through John Wyeth & Bro., the firm will have plants in Britain, Canada, Argentina, Australia, New Zealand and South Africa. The concern proposes to promote research on penicillin production, methionine, pyridoxine and biotin.

A Portable Electron Microscope

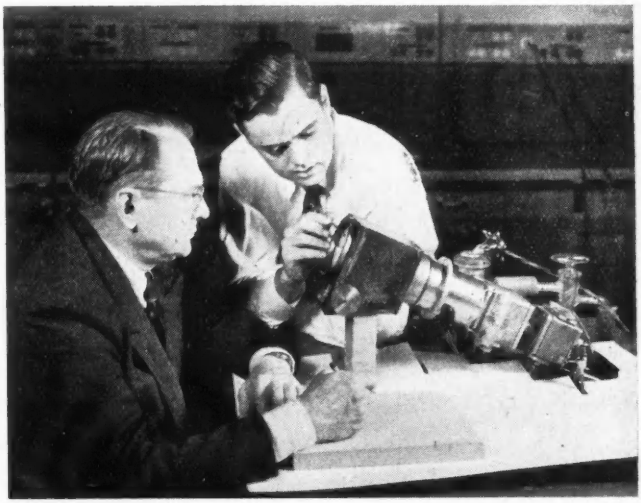
Its Use in Chemistry

A NEW electron microscope, small enough and sufficiently inexpensive to make it available to hundreds of medical, university, and industrial research institutions, has been developed by R.C.A. Laboratories. Dr. V. K. Zworykin, associate director of the Laboratories, announced this new development in electron microscopy at a joint meeting of the National Industrial Chemical Conference and the Chicago Section, American Chemical Society, held in Chicago on November 26. Light enough to be portable, the new instrument makes one of science's latest and most powerful tools available to war work on a wide scale. It is capable of magnifying infinitesimally small particles of matter up to 100,000 times, and in this respect it equals in performance the standard-size instrument, introduced by R.C.A. two years ago (*see* THE CHEMICAL AGE, 1943, *49*, p. 5)

Because of its greatly increased availability, Dr. Zworykin foresaw the post-war possibility of the broadest attack in the history of scientific research on the so-called sub-microscopic mysteries of biology, physics, and chemistry. In these all-important fields of study, and in their subdivisions such as medicine, bacteriology, the study of viruses, metallurgy, ceramics, plastics, and molecular arrangement, Dr. Zworykin said, lie many unsolved problems fundamental to life and industry. Society may look forward, with assurance, he declared, to the time in the relatively near future when researches made possible by this new instrument would bring about solutions which would greatly enhance human health, efficiency, and comfort.

Dr. Zworykin made it clear that the standard electron microscope is by no means superseded by the new small model, but he explained that it had been found in numerous electron microscope researches that the versatility of the larger instrument was unnecessary.

Mounted on an ordinary desk, the microscope column, from electron source to fluorescent screen or plate, measures only 16 in. (The height of the standard electron microscope is 7 ft.) The magnification of the new microscope, which operates with two magnetic lenses of fixed strength, is approximately 5000. Since the grain of the photographic materials normally employed is fine enough to permit twenty-fold enlargement, micrographs with a total magnification of 100,000 may be obtained with the instrument. This is adequate to make use of the full resolving power of the microscope, and contrasts impressively with the magnification of 2000 times obtained with light microscopes. Furthermore, the finest detail resolvable by the light microscope is approxi-



The new portable electron microscope developed in the R.C.A. Laboratories. Dr. V. K. Zworykin (seated) and Dr. James Hillyer are seen inspecting the instrument.

mately a hundred-thousandth of an inch while that of an electron microscope is of the order of a ten-millionth of an inch.

Speaking on electron microscopy in chemistry, Dr. Zworykin gave a comprehensive outline of the new lines of research made possible by the electron microscope, as well as new developments in the instrument. Among other things he told of the important war work being done in specialised fields of plastics and synthetics, including artificial rubber. Micrographs of particles of matter within the dimensions of the larger molecules have been made, and with further refinement of the instrument, Dr. Zworykin said, molecules of moderate size would become objects for observation. To illustrate the instrument's magnification, he showed a slide micrograph of the fully polymerised vinyl chloride in the synthetic rubber known as Koroseal and called attention to certain fine dark specks visible in the micrograph, which he said were small enough to constitute a single molecule. He also referred to the instrument's potentialities in the study of dusts and smokes of various kinds. These materials might constitute simply a health hazard; on the other hand, they might also find application as preservatives, pigments, insecticides, chemical reagents, and catalysts. In all instances, importance was attached to the shape and size-distribution of the individual particles, which more commonly than not were too small to permit a determination of these factors with the light microscope. Frequently, an electron micrograph indicated directly and convincingly the reason for peculiar physical or chemical properties. It made possible such things as the determination of the fineness of division or the surface area of tiny particles, factors of great importance in many pharmaceutical preparations; the study of dehydration and disintegration processes of kaolin, important items in ceramics research; the surveillance of ores and of wastes during grinding; and more detailed examination of thin metallic films.

Of real importance, especially to the chemist, is a new adapter unit which converts the electron microscope into a high-precision electron-diffraction camera. By analysis of the crystalline structures of materials it can be used to identify large numbers of chemical compounds. With this adapter in use, electrons are deflected or diffracted through angles which are characteristic of the relative separations and orientations of the atoms in the crystal lattice of the specimen.

Chemical Workers' Union

Agreement with A.S.S.E.T.

AN agreement has been made between the Association of Supervisory Staffs and Engineering Technicians (ASSET) and the Chemical Workers' Union with the purpose of eliminating non-unionism in the chemical industry, and of clarifying the situation with regard to the two functional grades in the industry; (a) the supervisory and administrative staffs, and (b) all other workers. ASSET will recognise the C.W.U. as the sole appropriate union to cater for all workers in the chemical and allied industries, with the exception of the grades mentioned in (a) above, who are considered to be on the management side, functionally speaking, and are catered for by ASSET. Should there be a dispute on the job as between a supervisor member of ASSET and an operative worker member of the C.W.U., the matter shall be dealt with as an inter-union matter and shall not be referred to the higher management. Where considered advisable, joint committees representative of both unions in a given factory shall be set up. In the event of an officially recognised dispute between one of the unions concerned and any body of employers, the members of the other union shall observe strict neutrality and not take the place, temporarily or otherwise, nor perform the duties, of any member of the first union who may be affected.

Leather Treatment Control

I.S.L.T.C. Meeting

THE third meeting of the Manchester Group of the International Society of Leather Trades' Chemists was held on November 27, at the Engineers' Club, Manchester. The first paper, on "Notes on the Drying of Sole Leather," was given by Mr. F. H. Quinn. Mr. Quinn discussed the various methods of controlled sole-leather drying and gave figures for the relation between relative humidity, temperature, and amount of water in the air. Figures for the drying of sole leather were suggested as follows: relative humidity 75 per cent., at a temperature of 78° F. Controlled drying by this method can be reduced to a few days in summer or winter where, before, the time taken was as much as two weeks.

This was followed by an interesting paper by Mr. R. Poulter on the "Liming of Calfskins." The methods were divided into three groups: (1) Slow methods using limes with only small amounts of sharpening agent in either a pit or a paddle; (2) quicker methods using a painting process for unhairing followed by processing in a paddle or drum; and (3) short processes using highly alkaline liquors for a short period in a drum. The second method was recommended as giving the best results from the point of view of ease of handling, clean fleshing and scudding, time taken and, of course, the quality of the resultant leather.

Industrial Dermatitis*

An Outline of Modern Prevention Methods

HIGH among the causes of lost time in industry is acute inflammation of the skin, caused by substances used in various operations and processes. The rather formidable name for this is "Industrial Dermatitis"; and the formidable fact is that, excluding accidents, dermatitis comes next to miners' diseases as the biggest cause of payments in industry under the Workmen's Compensation Acts.

Its toll of working hours is serious; and is not merely due to the time lost in treatment. The liability of recurrence must be considered, for it may be inadvisable for sufferers to return to work on which the trouble was contracted. The cost of further training and of labour replacement is thus added to that of lost time.

Although dermatitis is compensatable, employers are not obliged to notify its occurrence; but large numbers of them do so voluntarily, thus co-operating with the Factory Department in combating the condition. The number of cases voluntarily reported to the Factory Department increased from about 2000 in 1938 to nearly 5000 in 1940, and advanced to 8802 in 1942. The American figure for 1940 is even more striking, for in that country some 20,000 employees lost an average of ten weeks' work in the year through this cause.

A Widespread Danger

Although industrial dermatitis is so widespread, many industrial processes are not necessarily dermatitis-producing. There are acknowledged dangers in contact with mineral oils, explosives, synthetic glues, and soldering fluxes; but in many branches of industry the condition is found, although effective preventive measures are now available.

The causes and treatment of industrial dermatitis have long been studied; but what is of immediate importance to managements is the recent better understanding of its prevention. It is fully established that, in the majority of cases, dermatitis in industry can now be prevented. That is a sweeping and significant statement, but the facts are inescapable. We repeat that, in the majority of cases, *dermatitis in industry can now be prevented.*

The first signs of dermatitis vary widely, ranging from a rash that merely irritates, to blistering, cracking of the skin, severe irritation and so forth. The first line of resistance is a healthy skin, and the cycle of preventative measures involves: (a) selection of personnel; (b) protection of their skin while at work; (c) regular inspections (to detect onset, etc.); (d) cleanliness.

Where there is a dermatitis hazard managements are well advised to allocate personnel with care. Adverse factors to be considered (though they should not necessarily mean rejection) include: (1) a previous attack of dermatitis; (2) existence of any skin disease; (3) marked abnormalities of the skin, including excessive dryness or excessive sweating.

It is now well recognised that the state of bodily nutrition is reflected in the degree of resistance of the skin's surface cells. At one time, after a period of unemployment an increased liability to dermatitis was demonstrable. Tests of the reaction of the skin to an irritant ("patch tests") have been evolved, but their value is limited because of the difficulty of reproducing with exactitude the varied conditions found in the factory. Right selection of personnel is therefore difficult, for no hard and fast rule can be laid down; but the foregoing facts, carefully considered, will certainly assist personnel managers and others concerned.

Protection is essential, but the implications of the term are wide. It includes the mechanical protection afforded by satisfactory ventilation, and the diversity of guards that may be appropriate to limit contact with irritant materials; and protective clothing such as gloves, aprons and boots.

Inspection of the exposed skin should be by a responsible person having some knowledge and experience of the condition (for example, a nurse or first-aid attendant) to ensure early detection of inflammation and proper use of preventative measures. It is important that the earliest signs of irritation should receive attention. If intelligent inspection is supplemented by appropriate measures—ranging from additional protection to a change (perhaps only temporary) of work—the incidence of severer cases will be reduced.

Cleanliness

Whatever the skin irritant encountered may be, it must never be allowed to remain on the skin when work is over. The usefulness of well-designed washing accommodation with the necessary hot water, soap and clean towels, will be enhanced if placed, when in use, in the charge of a responsible person.

In shops where dermatitis is likely, not less than one wash basin (or 2 ft. of trough) for every ten persons is desirable; where

* From *Production and Engineering Bulletin*, 1943, 2, 13, p. 601.

poisonous materials are handled the standard is one wash basin or its equivalent for every five persons.

Facilities for bathing, including shower baths, should also be considered where the work is hot and dirty, necessitating change of clothes; encouragement to change the clothes and provision of facilities will diminish the risks of dermatitis in such conditions.

Common Risks

What are the common irritant risks to the skin in war industry, and where are they encountered? The heaviest incidence of dermatitis is due to oil, chemicals, alkalis, solvents and degreasing agents. Synthetic glues in aircraft work also need special attention; all types of such glue have been known to cause dermatitis.

Glue, for instance, should never be allowed to dry on the skin, from where it should be removed without delay by a damp swab. It is probably the formaldehyde in synthetic resin glues and the alkaline character of the casein glues which cause dermatitis. Special soaps for use at work have been devised to neutralise these harmful agents.

Where gun parts are made, dermatitis is due to the process used for browning gun barrels, breech parts and mechanism of machine guns and similar weapons. Caustic soda is used for preliminary cleansing of the surface of the steel, followed by a bichromate bath. These chemical agents are harmful in contact with the skin. The skin reaction to chromic acid and to the bichromates may not be the typical "chrome ulceration," which is notifiable. It may be dermatitis indistinguishable from that caused by other irritants. Cases have occurred in anodising where only a weak solution of chromic acid is used in an electrolytic bath. When solutions of chromic acid or of its salts are in use, with opportunities for superficial damage to the skin, this possible effect should be remembered.

Irritation of the skin and mucous membrane, probably intensified by ammonia, occurs in the use of chromating baths which are non-electrolytic. They are heated to a high temperature and generate fumes which must be exhausted from workrooms if damage to personnel is to be avoided. Otherwise the result may be ulceration and perforation of the nasal septum. (This trouble may occur only a few weeks after exposure.)

Other Irritant Chemicals

Chlorinated naphthalene waxes may produce a characteristic skin eruption. This is well marked on the forearms in early cases. It usually occurs on the face, and occasionally there are symptoms of malaise and depression, with digestive disturbances.

In processes where the synthetic enamels, cellulose, and phenol-type lacquers are used, some trouble with dermatitis has been experienced.

In filling factories those exposed to tetryl, mercury fulminate, and T.N.T. are also liable to dermatitis.

In the machining of light alloys the metal dust is another possible cause of dermatitis. Trouble is also encountered from the use of mineral oils; in fact, oil dermatitis is the most familiar type of industrial skin trouble. It was usually combated by cleansing the skin with a mild soap, followed by the application of lanoline or similar emollient. Increased knowledge has greatly improved on this technique.

While some chemical agents stain the skin, others cause excessive dryness that is more harmful. Dermatitis frequently follows an ulcer or skin injury that may have become septic. Sometimes it follows a burn.

Creosote is a strong skin irritant, and therefore a probable cause. The usual solvents such as petrol, alcohol, benzine, and alkaline solutions, leave the skin too dry and apt to become abraded by slight injury. The drying action of cement is also well known.

Other causes are the use of degreasing chemicals such as trichlorethylene, acids such as hydrofluoric used for etching, aquafortis and strong hydrochloric used on sheet metals and for electro-tinning, and the handling of soldering flux. In the rubber industry yet another cause may be hexamethylene tetramine (German trade name "Urotropine") which was used in small quantities as an accelerator. It may now have to be reckoned with in larger amounts for other uses.

Other instances could be quoted, but it has been shown above that there is liability to the trouble in a wide range of processes, and that the immediate causes differ considerably from one industry to another.

Rubber Gloves

In dealing with various chemical agents that attack the skin, rubber gloves used to be favoured as the chief preventative. Their use is compulsory in some processes. Apart from restricted supplies, high cost, etc., the use of rubber gloves and gauntlets for general use is open to objection. Rubber is easily damaged and is perishable. Even when heavy gauntlets of thickness from 1/32 in. to 1/16 in. were used with the caustic and bichromating processes for steel browning, it was common to find them in holes, or rotted or eaten through; becoming porous, they harboured the attacking agent and became a direct cause of acute skin trouble. Where rubber gloves are worn operators tend to take off the gloves and grip bare-handed for finer operation. If they put back a glove over a smear of the irritant, the ensuing trouble may be more acute and deep-seated than if there had

been no sheath. Irritation from deposits inside the glove may occur. Sweat inside a glove is also an incentive to take it off and wipe the hand with a rag, duster, or waste that may be impregnated with the irritant.

To restrict contact with irritants by protective clothing and by well designed ventilation and splash guards is not enough. These measures are important; but it is essential also to safeguard the exposed skin itself. Under the guidance of the Factory Department many large firms have instituted a preventative routine; and although the incidence of industrial dermatitis may have been previously heavy the affliction has now been virtually stamped out there. Preventative routine includes regular inspection on jobs with dermatitis hazard, adequate facilities for cleansing, and the issue of a barrier substance.

The skin's surface layer of horn cells, with the natural secretions, forms nature's first line of defence. In sound condition the horn cells would bar most irritants from the deeper layers of the skin where the trouble starts. But horn cells short of this high standard need to be assisted in their protective functions. How, then, is the natural resistance of the skin to be reinforced? The answer is—by the application, before work begins, of a " barrier substance." The selection of the right substance is of primary importance.

The Ideal Barrier

The requirements of a satisfactory barrier substance are that it should be :—

(i) *Non-irritating to the skin.* Preparations with an " acid value " much above or below that of the skin are liable to be irritating; and so are many antiseptics, dehydrating and degreasing agents.

(ii) *Insoluble* in substances such as oil, methylated spirit, and turpentine, against which skin protection is specifically required. (This criterion will require a range of formulæ for barrier substances, for use in the different circumstances.)

(iii) *Easily applied* to the skin, where it should be reasonably stable, *i.e.*, not becoming so dry as to crack or peel off.

(iv) *Non-slippery.* A barrier substance should not render the skin slippery or sticky so as to interfere with work.

(v) *Easily removed* after work by the ordinary procedure for washing without the aid of special cleansers.

An effective barrier substance dries rapidly, becomes invisible, and is usually effective for several hours, even if high temperatures are involved in the working conditions. In general, the most satisfactory barrier covering is an emulsified, colloidal type of compound, which is cohesive and elastic when dried on the skin. It may be water-, acid-, alkali-, or oil-resistant, according to the irritant encountered. It is quickly and easily washed off in water for on immersion the film expands or is dissolved and is then readily removed, taking the superimposed grime and dirt with it. Where there is a health hazard involving absorption through the skin (*e.g.*, T.N.T., nitrobenzene, and aniline) care must be exercised in using barrier substances; a substance such as animal fat applied to the skin may increase the risk of absorption through the skin.

In its campaign to protect workers from this troublesome condition the Ministry of Labour and National Service has the advantage of the co-operation of an Advisory Panel on Dermatitis in Industry of which dermatologists and other scientists—as well as representatives of the Government departments most concerned—are members.

Official Information

Executives who are combating dermatitis will find much valuable information on the subject in Form 330 (which has special reference to the use of barrier substances) and Form 331, which deals with dermatitis caused by glues used in aircraft construction. These forms are issued by the Factory Department of the Ministry of Labour and National Service, through H.M. Stationery Office, price 1d. each. Earlier pamphlets include Prevention of Dermatitis (Form 1863); Prevention of Oil Rashes (Form 296); and Dermatitis Among French Polishers (Form 1797).

In addition there is a useful series of cautionary notices in the form of placards that may be bought from H.M. Stationery Office. The series includes Form 367 (General), 1d. (2d.); Form 397 (Oil), 2d. (3d.); Form 396 (Lemon and Orange), 2d. (3d.); Form 398 (Chrome), 1d. (2d.); and Form 366 (Synthetic Glues), 2d. (3d.). Prices in brackets include postage.

MINOR INDUSTRIAL BURNS

Based on a study of 5609 cases of minor burns that occurred among employees of three large war factories in the U.S.A., the following treatment for minor industrial burns is recommended by two investigators, R. D. McClure and C. R. Lam, writing in the *Journal of the American Medical Association* (1943, *122*, p. 909): (1) wash the area with white soap and water; (2) do not break blisters or otherwise debride the wound; (3) cover with fine-mesh gauze impregnated with petrolatum or 5 per cent. boric acid ointment; (4) apply a firm dressing over this, bulky enough to keep dirt away from the injury but not so large as to keep the workman idle.

Lagging

An Important Item in Fuel Saving

ALTHOUGH insulation is one of the most obvious ways of saving heat, a surprising amount of heat is lost through inefficient lagging. This is sometimes due to lack of appreciation of the extent to which heat can escape from an unlagged surface, but it is more often due to lack of care in maintaining the lagging in good order, or because the lagging was not properly applied in the first place. When a surface is hotter than its surroundings, it radiates heat to the cooler objects around it. Moreover, air flows over the surface and thus takes heat away from it by contact, being itself warmed up in the process. The rate at which heat escapes from a hot surface depends on how hot the surface is and upon whether a wind (or draught) is blowing over the surface.

Some Pointed Figures

It is always easier to grasp what is happening if the story is put into figures, and here are some figures to illustrate the point. Let us suppose that the temperature of the air is 70° F. and that a surface at 100° F. is losing heat in still air (no wind or draught) at a rate called 1. The relative rates of heat loss in still air are then approximately as follows:—

Surface temp.	100°F.	200°F.	300°F.	400°F.	500°F.
Rate of heat loss	1	6	13	22	34

If there is a current of air over the pipe, the loss is increased. Thus, taking 200° F. as the comparison figure, we have:—

Wind velocity ...	miles/hr.	0	10	20	30	60
	feet/sec.	0	14.7	29.4	44	88
Rate of heat loss	...	6	6.6	7.5	8.2	10.4

From these figures it will be clear that the only way to reduce this heat loss is by reducing the temperature of the outer surface. This is effected by applying insulation or "lagging." If the surface temperature could be so reduced that it was the same as that of the outer air, there would be no loss of heat. It is not possible, however, to go quite as far as this in practice, but a really good insulation will save as much as 95 per cent. of the heat loss.

The following table shows the actual extent of the heat losses from a pipe conveying saturated steam in still air:—

Pressure of steam—lb./sq. in. ...	70	220	570
Temperature of steam—°F. ...	300	390	480
Heat loss from bare pipe—B.Th.U./sq. ft./hr.	650	1080	1650
Heat loss as tons of coal per year per 100 ft. of 6 in. pipe	43	72	110

The importance of some form of insulation will thus be seen from the above example; quite a small thickness of reasonably good insulation will save at least 80 per cent. of the loss.

Insulating material consists of some substance which will resist the passage of heat through it. Air is a very bad conductor of heat, and therefore such materials generally contain a great number of small air-pores throughout their bulk. If the insulation is allowed to get wet, the air in the pores is replaced by water and because water is a much better conductor of heat than air (25 times better at about 200° F.), the insulating material loses most of its valuable heat-saving property. The first rule, therefore, is that the insulation must be *kept dry*. It must obviously be dried when it is put on the surface that it is to insulate. On the other hand, it is very important that the insulation should be properly applied to the surface. If it is packed too tightly, the material is compressed, air spaces are reduced, and again the material conducts heat too well. If, owing to vibration or improper fixing, the insulation shakes down into a compact mass at the bottom and exposes part of the pipe at the top, the condition is even worse. The greatest care is needed in putting insulation on a pipe or other surface. A good insulating material may be spoiled by careless application. Some insulating materials are supplied by manufacturers in the form of mattresses, slabs, or shaped sections and then fastened in position by straps, clips, or wires. Slag wool, glass wool, and asbestos are generally used in prepared forms, and are simple to apply if the manufacturers' instructions are carefully followed.

Plastic Magnesia

The most common lagging material to-day is 85 per cent. magnesia, and is often applied in the plastic form by the user himself, or it may be obtained in the pre-moulded slab or sectional form mentioned above. It consists of 85 per cent. of basic magnesium carbonate with which is incorporated 15 per cent. of asbestos fibre. The carbonate begins to decompose and disintegrate at about 600° F. (320° C.), so that above this temperature it must be protected from the hot surface by a layer of special heat-resisting cement which is applied as a primary covering, the thickness being such that the magnesia does not become heated to its temperature of decomposition. Plastic magnesia is supplied as a powder, and is first mixed into a suitable paste with water. The plastic mixture is applied by hand in rough coats or layers each about ½ in. thick, leaving deep finger-marks to serve as a key for subsequent coats, until the required thickness is reached. Each layer must be allowed to dry completely before the next is added and the surface must therefore be hot enough to dry out the

insulation; the temperature of the surface should be about 125° F. at first, and this may be increased as further layers are applied. If the total thickness of the insulation exceeds 2 in. it should be reinforced with a layer of wire netting at its mean width.

The next stage is to give the magnesia an outer protective covering of not less than ½ in. of hard-setting, non-conducting plastic composition applied over a layer of wire netting laced with soft wire. Galvanised netting is best, but if it cannot be obtained, ungalvanised wire may be used. This outer layer must be finished to a smooth surface to reduce heat losses, and when situated under cover should be given two coats of paint, preferably aluminium paint, which should not be applied until it is certain that the insulation is perfectly dry. For outdoor work, the insulation should be covered with a layer of waterproof roofing felt kept in position by metal strips or wire netting (again galvanised if possible) and then given two coats of waterproof bituminous paint or tar.

The thickness to which insulation should be applied depends on the temperature of the surface, and, in the case of a pipe, on its diameter. While increasing the thickness will in general reduce the amount of heat lost, it will be found that, for a given set of conditions, there is an economic thickness of insulation beyond which it is not practical to go. Makers will generally give advice on the subject. Although in this article only surfaces at fairly high temperatures have been considered, it is equally necessary to insulate hot-water tanks, pipes, calorifiers, etc., for the slower rate of heat loss will still amount to very considerable wastage of coal over the year.

It is frequently noticed that valves and flanges are left uncovered. This is a very prolific source of waste, since much more heat is dissipated from these than from the same length of piping. They are rather more troublesome to lag, but it can be done quite easily with plastic materials. The objection is sometimes made that leaks are less readily noticed when flanges and valves are covered with lagging. While this is to some extent true, they are much more likely to remain free rom leaks if they are lagged, provided that they are in good condition before insulation. This is on account of the comparative freedom from differential temperature stress in lagged appliances.

Painting hot surfaces with ordinary paints is quite useless, but aluminium or even bronze paints, if obtainable, do reduce the loss of heat quite considerably. They are not an effective substitute for lagging but they are considerably better than nothing.

Chemicals in War and After

Forthcoming A.Sc.W. Exhibition

THE Chemical Industry has received less public attention than the engineering industry or coal mining. Yet its products are no less necessary both for the present war and for post-war reconstruction. Even the employees in the industry, many of them recruited from other trades within the past few years, have no sense of the essential unity and importance of the various industries and trades making up the chemical industry. Trade unionism is weak, joint production committees almost absent and, worst of all, there is a general lack of interest in the problems of the industry among all labour and trade union organisations.

The North-West Area Committee of the Association of Scientific Workers has decided to organise a large public exhibition, under the title of "Chemicals in War and Reconstruction," in furtherance of the Association's policy of improving the war effort and also of increasing public appreciation of the value of science.

The exhibition will be designed to reach: the manual employees in the chemical industry, to bring home to them the importance of their work; workers in other industries using chemical products; and the general public, to increase its knowledge of and its interest in the chemical industries.

The following sections and exhibits will be included: (1) heavy chemicals, their production and use in the glass, leather, explosives and soap industries; (2) coal derivatives, including both the products of the gas industry and hydrogenation of coal, underground gasification, etc.; (3) plastics and synthetic rubber; (4) petroleum refining and products; (5) paint and varnish industry; (6) raw materials of the chemical industry—coal, sulphur, salt, lime, etc.; (7) medicinals and health; (8) the rôle of the technician; (9) the use of chemicals in agriculture, engineering and textile industry; (10) chemicals essential for the production of a Lancaster bomber.

The exhibition will be open at Manchester in February, and will visit several other important centres in the North-West.

The full exhibition will consist of 14 to 15 large stands, supplemented by posters, exhibits provided by various firms, models, samples of plastics, etc., and a few larger exhibits such as a rubber aircraft dinghy. The full exhibition will thus take up considerable space, but it will be easy to cut down the size for showings in smaller halls. It should thus be possible to arrange for display in the canteens of R.O.F.'s and of large factories.

Preparation of Penicillin

Professor Florey's Lecture

SOME interesting details about the chemical processes involved in the preparation of penicillin for medical use were given by Professor H. W. Florey, F.R.S., in his lecture to the Royal Institution on December 10. After first referring to "the very acute observation" of Professor Alexander Fleming in 1929 which revealed the bacteriostatic action of the mould *Penicillin notatum* on certain bacteria, Professor Florey showed his audience, by coloured slides and actual specimens, how the mould is cultivated. It was originally grown on broth, but later this was replaced by a synthetic medium (a modified Czapek-Dox medium containing sodium nitrate, potassium dihydrogen phosphate, potassium chloride, magnesium sulphate, ferrous sulphate, and glucose). The original cultures were obtained in flasks, but afterwards one litre porcelain vessels were used; these had flat tops and bottoms, so that the vessels could be stacked in tiers on the shelves of an incubating chamber. A good brew of penicillin was found to be present in the culture medium by the time the mould culture began exuding drops of yellow liquid.

Early Investigations

The first attempt to concentrate penicillin was made by Raistrick and co-workers at the London School of Hygiene and Tropical Medicine. The liquid from the culture vessels being acidified and shaken with ether. The penicillin was dissolved in the ether fraction, but it was found impossible to obtain the penicillin from this solution by distilling off the ether, owing to the thermolabile nature of penicillin.

The investigation of penicillin and other bacteriostatic agents began at Oxford in 1938. To enable the concentration of penicillin in any extract to be determined rapidly, a assay method was devised; this technique is described in the recent paper by C. C. Lucas in *Canadian Chemistry and Process Industries* (September, 1943) and it depends upon the measurement of the area over which a fixed quantity of penicillin extract exerts its bacteriostatic action in an agar culture of some test organism such as *Staphylococcus aurcus*. This method of assay enabled the Oxford workers to check the course of the penicillin after an extract of the drug had been submitted to any particular process. For the first concentration, amyl acetate was used in place of ether. The acid solution in amyl acetate was then neutralised with sodium bicarbonate solution, and after amyl acetate and water had separated into layers the penicillin was found to be dissolved in the water. Further concentration was achieved by the same device of acidification in the presence of an organic solvent (chloroform), followed by neutralisation of the acid when the penicillin returned to aqueous solution.

The yellow powder finally obtained was the sodium salt, which is stable between *p*H 5-7, but which is destroyed by heavy metal ions like copper and lead. Professor Florey showed a colour film of the pilot-plant process that was devised at Oxford, and his audience was fascinated by the "shots" of the improvised apparatus, which included such homely items as a household bath, milk churns, and a milk cooler. Professor Florey said that the greatest technical difficulty to be overcome in large-scale manufacture of penicillin was its destruction by air bacteria. The percentage of penicillin in the present medicinal preparation was only 10-20 per cent., he added. Further concentration by means of chromatographic adsorption on alumina and other materials was proceeding in order to obtain pure penicillin, from which the chemical structure of the penicillin molecule would be investigated with a view to an attempt at synthesis.

Industrial Mould Production

Machine Propagation of Aspergillus

IN America a machine has been patented by Dr. Leo Christensen (U.S.P. 2,325,368) for the mass production of the mould *Aspergillus oryzæ*. This fungus contains a starch-splitting enzyme which is valuable in the manufacture of alcohol. Before the war the Americans imported this mould from Japan, where it is used to obtain saké from rice.

The process starts with the preparation of a bran mash in a "mingler" that works rather like a concrete mixer. Water containing the necessary mineral salts is added, and the resulting mash is slowly carried on a conveyor belt through a steam steriliser, and then through a cooling chamber. After this process the mash falls into a second mingler, where myriads of the mould spores are blown on to it. It then passes on to the fill pans which are carried on a second belt; this proceeds very slowly through a closed warm tunnel, where the spores germinate and the mould grows into a practically solid white mat. At the end of this line the mass

is broken up into small fragments, and may also be dried. The mould is then ready to be packed and shipped to the distilleries and industrial alcohol plants.

Clavacin

A new bacteriostatic agent called clavacin is also reported from the States. Derived from a common mould known as *Aspergillus clavatus*, it is claimed to be effective against all the bacteria that are susceptible to penicillin, as well as some others upon which penicillin has no effect. Clavacin was discovered by S. A. Waksman, of the New Jersey Agricultural Experiment Station. Further investigations into its properties are being made by H. W. Anderson, of Illinois University. The trustees of the same university have approved a three-year research project, the objective of which is the synthetic production of penicillin; the Upjohn Company, of Kalamazoo, Michigan, which is engaged on the commercial preparation of penicillin, has given support to this project with a grant of $75,000.

Penicillin Manufacture

An industrial committee which will advise on the manufacture of penicillin has recently been set up in America, under the chairmanship of a government official, Mr. F. J. Stock. The following organisations are represented on this committee: Upjohn Co., Commercial Solvents Corp., Hoffman LaRoche, Merck & Co., Cheplin Biological Laboratories, Winthrop Chemical Co., Lederle Laboratories, Parke Davis & Co., Abbott Laboratories, Schenley Research Institute, Cutter Laboratories, E. R. Squibb & Sons, Eli Lilly & Co., Reichel Laboratories, Heyden Chemical Corp., Chas. Pfizer & Co., and Ben Venue Laboratories.

A CHEMIST'S BOOKSHELF

NOXIOUS GASES. By Yandell Henderson and Howard W. Haggard. 2nd Ed. New York: Reinhold Publishing Corpn. Pp. 294. $3.50.

The principal aim of this volume is the eminently practical one of making available "the knowledge, the principles, and the techniques upon which measures of prevention and of safety in industry must be based," so far as concerns the gases mentioned in the title. It is to be observed that the authors do *not* here deal with war gases, but only with those that are likely to contribute an industrial hazard; to give the devil his due, however, they are fully aware of the indebtedness which industrial safety workers owe to the investigations that have been made in defensive chemical warfare.

The full title of the book is "Noxious Gases, and the Principles of Respiration Influencing their Action"; and, as might be guessed, the problem is approached from the standpoint of physiological chemistry. The key-note of the whole work is "volatility," and the features of toxic action dependent on volatility have been the subject of the authors' special study. The importance of volatility in poisonous gases has been stressed lately in the pages of THE CHEMICAL AGE, and a further authoritative study of the subject is welcome, especially as the literature specifically devoted to this aspect of the subject is still scanty.

A useful and interesting feature of the book is the rather full description of the function of respiration. This, indeed, occupies the first section and is followed by general notes on the behaviour of gases. Noxious gases are next classified according to their physiological action, and then follows the more strictly chemical portion—nine chapters dealing with the individual gases and their peculiarities. Two extremely useful chapters on preventive measures and methods of resuscitation, together with a supplementary note on breathing machines, complete what is an eminently practical and surprisingly concise piece of work, of the highest value to the chemical industry.

The American Chemical Society is to be congratulated on the inclusion of this volume in its series of scientific monographs.

POST-GRADUATE LECTURES. By H. J. Emeléus and H. B. Watson. London: Oil and Colour Chemists' Association. Pp. 84. 10s. post free.

The foreword gives a clue to this book's purpose when it refers to the ruthlessness with which time separates us from fundamental teachings of our schools, colleges and universities. Professor Emeléus and Dr. Watson are to be congratulated in showing a very practical sense of what was required of them. The volume includes three lectures, two by Professor Emeléus, on the Structure of Inorganic Compounds, and the Technique of Inorganic Chemistry, and one by Dr. Watson entitled Modern Views of Some Reactions of Organic Compounds. Quiet reading of these lectures testifies to the value of the authors' experience.

Among the subjects dealt with are the following: atomic lattices, with special reference to alloys and common minerals: experimental technique applied to artificial radioactive substances, isotopic separations, the properties of deuterium, boron and silicon hydrides, the halogen fluorides, and reactions in non-aqueous solutions. Substitution reactions, addition reactions, isomeric change, and the many classical reactions are studied from the standpoint of the modern conception of electronics in relation to organic chemistry.

ORGANIC REAGENTS FOR METALS AND FOR CERTAIN ACID RADICALS. 4th Ed. London: Hopkin and Williams. Pp. 176. 4s., post free.

The new edition of this book easily maintains the rate of advance shown in the earlier editions. Through the inclusion of five new reagents, and the omission of two which have not aroused much interest, the total number of monographs has been increased to 43, from the 40 of the third edition. It is interesting to note that only 17 reagents were dealt with in the first edition.

There has been considerable revision and expansion, which is perhaps most obvious in the bibliographies attached to each monograph. For example, the number of references dealing with sodium alizarin sulphonate has been increased from 15 to 62, that for cupferron from 38 to 82, and that for dimethylglyoxime from 47 to 124, while the monograph on the uses of 8-hydroxyquinoline, which comprises eleven pages of text against the six pages of the third edition, has 214 references where the previous edition had 119. Added precision in the use of nomenclature, and of such terms as "specific" and "selective" are worthy of note, as is also the table on one end-paper showing the interferences to be guarded against when testing for the various metallic ions in the presence of a thousand times the amount of other metals.

The typography and lay-out of the book are more open and more pleasing than those used in earlier editions; and a stout stiff binding is a welcome improvement to a book that will doubtless be required to stand up to heavy duty in any analytical laboratory.

Personal Notes

MR. JAMES H. WADSWORTH, a director of I.C.I., Ltd., London, has been appointed to the directorate of Imperial Chemical Industries of Australia and New Zealand, Ltd.

Two members of the Mineworkers' Federation, MR. S. WATSON and MR. G. H. JONES have joined the Council of the British Coal Utilisation Research Association. This organisation has now appointed a scientific advisory panel, comprising PROFESSORS C. K. INGOLD, H. W. MELVILLE, and R. G. NORRISH.

MR. RAPHAEL L. STERN, chemical superintendent of the Hercules Powder Company's plant at Parlin, New Jersey, has been awarded a citation of merit from the U.S. Army Ordnance Department for his adaptation of wood pulp to the manufacture of smokeless powder, in replacement of cotton linters in short supply. His revised method also enabled production costs to be lowered.

MR. JOHN G. ROSE, formerly Government Chemist and chief chemist to the South African Railways and Harbours, has been elected a Fellow of the Royal Society of S. Africa for his valuable applications of chemistry in the engineering field.

SIR ROBERT PICKARD has retired from the direction of the British Cotton Industry Association Research Station at the Shirley Institute, after 17 years in that post. He is succeeded by DR. F. C. TOY, who has been deputy-director for 13 years. DR. G. W. HILL is the new deputy-director.

Obituary

MR. JAMES STANLEY ADDISON, managing director and deputy-chairman of Courtaulds, Ltd. (*see* THE CHEMICAL AGE, October 31, 1942, p. 382) has died in London at the age of 62. He was also a director of British Cellophane, Ltd.

New Control Orders

Toilet Preparations

THE following will be the rates at which registered manufacturers who receive Board of Trade licences to manufacture and supply toilet preparations will normally be permitted to supply controlled goods for the period January 1 to June 30, 1944: (1) Registered manufacturers participating in approved concentration schemes will be permitted under licence to supply 37½ per cent. by value of their supplies of controlled goods of their own manufacture in the standard period, *i.e.*, June 1, 1939, to May 31, 1940. (2) Registered manufacturers not in approved concentration schemes will be permitted to supply 16 2/3 per cent. of their supplies of controlled goods of their own manufacture in the standard period. The above rates will apply to all controlled toilet preparations, including powder.

HENDERSON MEMORIAL FUND

The death last year of Dr. George Gerald Henderson, Emeritus Professor of Chemistry at Glasgow University, robbed Scottish chemistry of a man who was affectionately appreciated by industrialists and students alike. His students will welcome the opportunity now being presented to create a permanent memorial to his work by the establishment of special prizes, scholarships, or laboratories. A committee of former students has undertaken this duty, and Dr. J. Bell, F.I.C., Chemistry Department, the University, Glasgow, and Mr. J. G. Duncan, F.I.C., Chemistry Department, the Royal Technical College, Glasgow, have agreed to act as hon. treasurers of the fund. The exact form of the memorial will depend on the response to the appeal.

General News——From Week to Week

The agricultural war committee of Scotland has asked the Department of Agriculture to support an application made by them to the Ministry of Food for the opening of dehydrating factories in Scotland to deal with seasonal surpluses of potatoes.

As in former years, Messrs. Rhodes, Brydon & Youatt, Ltd., of Stockport, are issuing a useful yearly diary in the form of a desk pad to all their customers who acknowledge their wish to possess one by sending the nominal fee of one penny. All proceeds will be devoted to the Red Cross.

At the annual meeting of British Celanese, Ltd., Dr. Henry Dreyfus said that in the field of synthetic rubber production the company had been active for many years, and all the known synthetic rubber products, and many up till now unknown, would be produced by them.

Two tons of zinc phosphide were used to poison the sausage-meat bait laid to tempt the rats, in the Ministry of Food's great drive against this London pest. It is estimated that at least a million sewer-rats met their death as a result of the first phase of the Ministry's attack on their "3000-mile-long front."

The Trading with the Enemy (Enemy Territory) (Cessation) Order, 1943 (S.R. & O. 1943, No. 1684), dated December 9, gives certain areas which cease to be treated as enemy territory as from the date of this Order, *viz* : Corsica, Syria and the Lebanon, French Somaliland, Algeria, the French Zone of Morocco, and Tunisia.

The purchase and repair of discarded rubber boots will be facilitated by a new Ministry of Supply Order which came into force on December 20—the Control of Rubber (No. 20) Order, 1943 (S.R. & O. 1943, No. 1695). The effect of the Order is to remove rubber boots or overboots from the provisions of the Control of Rubber (No. 18) Order when they are acquired for the purpose of repair or reconditioning.

Owing to the increasing use of polyvinyl chloride compounds for cablemaking, the Plastics Control and the Cable Planning Organisation of the Ministry of Supply have decided to standardise these compounds for general and specialised cable manufacture on and after December 15. The advantages of this scheme will be twofold: first, the reservation of essential materials; and secondly, a guarantee to purchasers that polyvinyl chloride cables to any specification will be made from compounds of the standard required, regardless of the source of manufacture.

A national joint board of the iron-ore industry has been set up and will become effective in the New Year, it was announced at the half-yearly meeting of the Cleveland Miners' and Quarrymen's section of the National Union of General and Municipal Workers. The board will consider the post-war position of the industry with a view to co-ordinating all districts producing British iron-stone and iron-ore.

The shortage of penicillin has been the subject of two parliamentary questions to the Minister of Supply. In a written reply, it is stated that the total supply will, for some considerable time, be insufficient to meet Service requirements. Limited quantities are being made available for clinical trials, and efforts will also be made, as soon as circumstances permit, to allocate some supplies for the civilian population. The Ministry offers no indication as to when supplies will be generally available.

Hickson & Welch, Ltd. (dye and intermediate manufacturers), celebrated the 50th anniversary of the foundation of the firm, on December 17, by an evening entertainment for their employees and friends. Mr. Bernard Hickson, M.Sc., A.I.C., chairman and managing director, presented gold watches, on behalf of the company, to Mr. H. W. Hull (secretary) and Mr. W. Williams (engineer) and 10 War Savings Certificates each to 27 employees as a mark of appreciation for long service.

Over the next two or three years, the B.C.U.R.A. will spend up to £500,000 on hydrocarbon research, according to a statement of Sir Evan Williams, in his presidential address at the annual meeting of the association last week. Its aim is to develop synthesis processes for making oils from coal more efficiently than by the Fischer-Tropsch process, and to provide the chemical and allied industries with raw materials from home sources. An immediate start has been facilitated mainly by the increase of 50 per cent.—to £120,000—in the Mining Association's annual grant.

A new antibiotic has been found to be produced by the mould *Aspergillus giganteus* (*Nature*, 1943, *152*, p. 725; *cf.* p. 612 of this issue of THE CHEMICAL AGE). In all its chemical and biological properties the substance appears to be very similar to penicillin, but its yield is lower and its purification no easier than that of penicillin, though the mould produces much less pigment than does *Penicillium notatum*. It is suggested that the substance be called gigantic acid to indicate its source.

The possibility of a cheap non-tropical rubber crop from the Russian kok-saghyz dandelion was envisaged by Mr. G. Martin, research superintendent to the London Advisory Committee for Rubber Research, in a statement last week. If the rubber content of such plants, normally 5 per cent., could be raised to 20 per cent., a crop based on mechanical cultivators, harvesters and mass production, with rubber selling at 6d. per pound, was not impossible.

The importance of developments in the plastics industry to a textile city like Dundee was stressed by Dr. Robert Roger, lecturer in chemistry at University College, Dundee, when he addressed the local Soroptimist Club and showed them a range of plastic products. There had been a great increase in strength, he said, by the bonding of paper, wood, and cloth (such as linen, cotton and jute) to give laminated plastics which were being used to produce switch and wall boards, doors, bearings, gearwheels, tubes and pipes. Dr. Roger also exhibited a range of synthetic textiles, including nylon, vinyon, alginate floss, peanut yarn, and the properties of each were explained.

Foreign News

The Brazilian Government has placed under control the sale of the following chemicals: iodine, iodides in general, calcium gluconate, sodium benzoate, white arsenic, and various analgesics. The sale of these chemicals requires authorisation from the Chemical and Pharmaceutical Products Control, which will determine quotas and prices.

The deficit in alcohol production in the U.S. next year will be 50,000,000 gallons, according to a War Production Board spokesman, who stated that requirements were estimated at 640,000,000 gallons and production at 590,000,000. Yet the actual output by June, 1944, will be five times that of a year ago.

Perfection of A.R.P. arrangements in American factories is encouraged by the establishment of "National Security Awards" by the Office of Civilian Defence—equivalent to our Ministry of Home Security. To qualify for this award, plants have to reach a certain standard as regards the provision and training of air-raid wardens, firemen, first-aiders and repair crews.

According to the U.S. Bureau of Mines, smelter production of copper in the United States from domestic ores in 1942 amounted to 1,087,991 short tons. This is a new record and compares with 966,072 tons in 1941. The production of primary slab zinc, from domestic ores only, amounted to 629,957 tons, and of refined lead from domestic ores (antimonial lead excluded) to 467,367 tons. Metallic mineral products produced in the United States in 1942 had a total value of $2,361,800,000, also a new record.

The electro-tinning technique has been developed by Du Pont's Electroplating Division to the extent that 20,000 lb. coils of steel strip, 36 in. wide, are now being coated at a rate of over 800 ft. per minute. Plating by electrolytic methods uses 40-65 per cent. less tin than the older processes.

According to Dr. R. H. Ball, a technical director of the Celanese Corporation of America, the U.S. production of cellulose acetate plastics over the current year would be between 75 and 80 million lb., while the total of all thermosetting plastics would be between 225 and 280 million lb.

A great expansion in the manufacture of lubricants is under way in France. Latest reports tell of new factories, plant and special funds set aside by the Government to meet this programme. It is intended that by the end of 1944 the country shall be able to supply 93 per cent. of its requirements instead of the present 48 per cent.

The Japanese search for a quinine substitute has been stressed in numerous propaganda broadcasts from Tokyo recently, and is suggested as evidence that Japan is seriously considering the possibility of losing Java. The natural supplies from Java should be sufficient to meet her present needs, particularly as output has been increased by 75 per cent. since the island's capture.

Fat and oil production in the United States from domestic materials for the 1942-43 crop year is estimated (in million lb.) at 11,000, or about 1000 greater than that of the 1941-42 year. The available supply will be only slightly larger, however, since the carry-over at the beginning of 1942-43 had fallen to 1800, from 2600 a year earlier. The supply situation may be eased by increased imports from Africa and South America.

New markets for bituminous coal in the United States are forceast for after the war in a recent survey by the director of the Bituminous Coal Institute. Production of tar acids—the basic ingredients of the plastics industry—the commercial development of coal hydrogenation processes, and the demand for industrial products, such as styrene and nylon, which are based on bituminous coal, will all have an important effect on the industry.

Dehydration of dried apricots and other fruits to a moisture content of 12-14 per cent., coupled with the addition of 2500-3000 parts of sulphur dioxide per million, gives a product that can be stored indefinitely even under tropical conditions. This discovery, made by research workers of the U.S. Army Quartermaster Corps, in collaboration with the University of California, is reported in an article about the scientific aspects of Army food in *Chemical and Engineering News* (1943, *21*, p. 1606).

Forthcoming Events

The Christmas lectures for children will this year be given at the **Royal Institution** by Professor E. N. da C. Andrade, whose subject is "Vibrations and Waves." The six talks, which will be illustrated by experiments will take place on **December 28** and **30** and **January 1, 4, 6,** and **8,** at 2.30 p.m.

On **January 3,** at 2.30 p.m., Professor C. R. Harington will deliver the Jubilee Memorial lecture of the **Society of Chemical Industry,** on the subject of "The Contribution of Chemistry to Immunology." The meeting will be held at the London School of Hygiene and Tropical Medicine, Keppel Street, W.C.

A lecture by Mr. J. K. Parkinson, B.Sc., on "Aluminium Pigments" has been arranged for the meeting of the Hull section of the **Oil and Colour Chemists' Association,** at 12.45 p.m., on **January 4.**

The Midlands section of the **Electrodepositors' Technical Society,** will meet at 5 p.m. on **January 4,** at the James Watt Memorial Institute, Birmingham, to hear a paper by Mr. A. F. Brockington on "Barrel Plating."

For the purpose of augmenting the Stalingrad Hospital Laboratory Fund the London Area Committee of the **Association of Scientific Workers** is organising a film show at the Cambridge Theatre, W.C.2, on **January 30, 1944,** at 6.30 p.m. The main feature of the programme will be "World of Plenty," which will be introduced by the director, Paul Rotha, to be followed by other scientific films. Tickets at 21s., 10s. 6d., 7s. 6d., 5s. and 2s. 6d. are obtainable from the A.Sc.W., London Area Committee, 59 New Oxford Street, W.C.1.

Company News

The Power-Gas Corporation, Ltd., is paying a first and final dividend of 10 per cent., plus bonus of 2½ per cent. (same).

Lightalloys, Ltd., announce a final dividend of 12½ per cent. (same). Trading profit for the year to June 27 was £31,876 (£39,795).

William Briggs & Sons, Ltd., are paying a final dividend of 20 per cent. (17½ per cent.) for the year ended September 30, making a total of 25 per cent. (22½ per cent.). Profit, after taxation, was £33,954 (£25,560).

South African Torbanite, Ltd., with an interim dividend of 5 per cent. in respect of the year to June 25, 1944, are paying their maiden dividend. The company was registered in 1934.

British Emulsifiers, Ltd., in respect of the year ended September 30, are paying a dividend of 7½ per cent. (12½ per cent.).

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

LANGLEY ALLOYS, LTD., Slough (M., 25/12/43).—November 27, additional security supplemental to a trust deed dated November 3, 1942; charged on lands and premises at Stoke Poges and Langley. *£142,387. August 3, 1943.

QUARTZ CRYSTAL CO., LTD., New Malden (M., 25/12/43).—December 4, £250 debenture, to W. J. Thomson, Surbiton; general charge. *——. December 31, 1942.

Satisfaction

SUTCLIFFE SPEAKMAN & CO., LTD., Leigh (Lancs.), machinery manufacturers. (M.S., 25/12/43).—Satisfaction December 7, of debenture registered December 20, 1923, to the extent of £30,000.

New Companies Registered

Tixo, Ltd. (384,422).—Private company. Capital: £100 in 100 shares of £1 each. To acquire from the Chemical Colloids Corporation, Ltd., the sales rights in all their "Tixo" products, and to carry on the business of chemical manufacturers, etc. Subscribers: J. Dyer; C. R. G. Young. J. Dyer is the first director. Registered office: 120-122 Victoria Street, S.W.1.

Chemical and Allied Stocks and Shares

ALTHOUGH inactive in most sections, the undertone of the stock and share markets has been inclined to improve. Sentiment benefited from the improved news regarding the Prime Minister, but owing to the small volume of business, movements in industrial securities were moderate. Imperial Chemical have remained at 38s. 6d. at the time of writing, and Borax Consolidated were again 35s. 6d., while Lever &

Unilever at 35s. were 3d. better on balance. Under the influence of further consideration of the annual results, Turner & Newall again moved higher, and are 77s. 9d. at the time of writing. Murex at 99s. 4½d. were within 7½d. of the level current a week ago.

British Celanese at 27s. 9d. regained part of their recent sharp decline, sentiment earlier in the week having been aided by hopes of favourable references to prospects at the annual meeting. Courtaulds at 51s. 6d. also recovered part of an earlier decline. Calico Printers and Bleachers held their recent gains quite well, as did Bradford Dyers, which were 22s. The market remains hopeful that the latter company will be able to resume dividends in 1944. In other directions, Associated Cement were maintained at 63s., while British Plaster Board at 28s. were virtually unchanged on balance. Wall Paper Manufacturers deferred, at 39s., were within 6d. of the level current a week ago; the yield is little more than 2 per cent. on the basis of last year's dividend, but this is an instance where there may be scope for post-war recovery in dividends to around the pre-1940 levels if market hopes are realised. Triplex Glass 10s. ordinary at 36s. 9d. also return only a small yield; this is another case where sentiment is influenced mainly by hopes of post-war recovery in dividends.

Nairn & Greenwich were firm at 66s. 10½d., awaiting the forthcoming financial results. Barry & Staines at 44s. 9d. have also more than held the improvement recorded a week ago. At 78s. 3d. British Oxygen have kept their recent rise; there is vague talk in the market of the possibility of a new issue on bonus terms to shareholders in 1944. Tube Investments further improved to 90s. 6d., it being pointed out that the recently-issued results showed the 20 per cent. dividend to be conservative, as fully 35 per cent. was earned on the shares. Stewarts & Lloyds improved on balance from 51s. 9d. to 52s. 3d., but Dorman Long eased to 28s. 1½d., United Steel to 24s. 7½d., and Guest Keen were 32s. 9d., compared with 33s. 1½d. Allied Ironfounders moved back to 47s. 9d., but elsewhere Babcock & Wilcox have been maintained at 47s. 4½d. at the time of writing. Lewis Berger remained steady at 92s. 6d., but Pinchin Johnson 10s. shares eased to 33s. 9d. De La Rue reacted from 157s. 6d. to 156s. 3d. British Industrial Plastics 2s. shares were 6s. 6d., and Erinoid 10s. 6d. At 47s. 3d. British Aluminium showed no change on balance, while at 39s. 9d. Dunlop Rubber regained part of an earlier small decline.

The units of the Distillers Co. at 87s. 6d. were little changed in price; the recent maintenance of interim dividend at 6¼ per cent. was in accordance with expectations, and it is generally assumed that during the remainder of the war period, the dividend total is likely to be kept at 16¼ per cent. After the war a larger proportion of earnings may be distributed in dividend, but much may, of course, depend on progress of the company's widespread and diversified interests. United Molasses at 30s. 6d. were virtually the same as a week ago.

British Glues 4s. ordinary were quoted at 7s. 9d., and William Blythe 3s. shares at 8s. 9d., while Greeff Chemicals 5s. ordinary were again 7s. 3d. Monsanto Chemicals 5½ per cent. preference remained at 23s. 6d. B. Laporte were 75s., W. J. Bush 60s., British Drug Houses 23s. 6d., and Burt Boulton 21s. 9d. Boots Drug kept at 41s. 6d., United Glass Bottle at 60s., and Forster's Glass 10s. ordinary were 30s. Oil shares have developed a better tendency at the time of writing; the "Shell" interim dividend announcement is due shortly.

British Chemical Prices

Market Reports

A STEADY movement is reported from most sections of the general chemicals market, and a fair amount of contract replacement business has been placed during the past week. So far as strictly new business is concerned, however, the market has been quiet, and a none too plentiful supply position continues to be the main feature, particularly in the potash and soda products sections. Liquid caustic potash is reported to be extremely scarce. In other directions the market has followed a steady course, and prices throughout are unchanged with a firm underone. There have been no changes of importance in the coal-tar products market, a satisfactory trade being reported from most sections. Pitch is enjoying a good home demand and there is a moderate call for the light distillates.

MANCHESTER.—Largely in consequence of seasonal conditions and also because of the fact that the majority of industrial consumers are already pretty well booked forward, business in heavy chemicals on the Manchester market during the past week has been less active so far as new bookings are concerned, although at the moment of writing there has been no noticeable decline in the general movement of contract supplies either of the alkali products or of the ammonia and magnesia compounds and the heavy acids. Between now and the turn of the year, however, some slackening in this respect may be looked for, stocktaking operations in some cases being a factor. Pressure for most of the tar products against commitments has also been maintained.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in this paper should not be taken as an indication that they are necessarily available for export.

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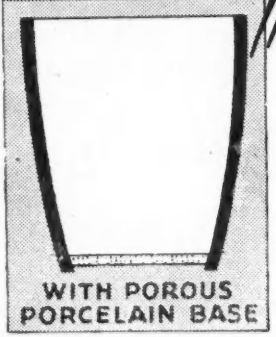

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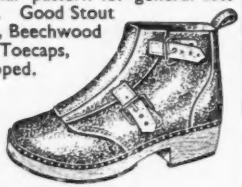

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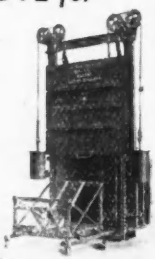

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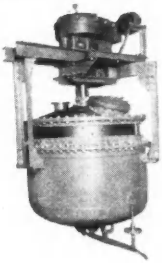

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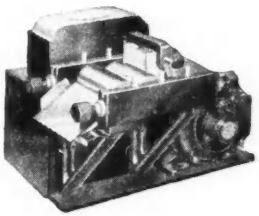

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